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PREDICTIVE CONTROL MODEL OF HIV/AIDS SPREAD WITH EMPHASIS IN NIGERIA

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Abstract-This paper focuses on predictive control model of HIV spread in Nigeria, with development of mathematical model, which was developed based on differential equation. MATLAB program is the chosen software used for stimulation based on mathematical model that was developed. With these model predictive controls trends of HIV can easily be carried out with chosen proportionality constant k which is a function of a time for control of HIV/AIDS.

Keywords and phrase: predictive control model of HIV/AIDS spread etc.

Introduction

A disease according to e- medicine/ Stedman medical dictionary look up (access 20011) is an abnormal condition affecting the body of an organism.
It often constrain to medical condition associated with specific symptoms and signs. It might be caused by external factor, such as infectious diseases or it may be cursed by internal dysfunctions, such as auto immune disease. Sometime, disease may occur due to injury, disability, disorder, syndrome, infections, isolated symptoms, deviant, behaviors and a typical variation of structure and functions, also disease may affect the normal function of organs that made up the body of humans.
HIV/AIDS are common diseases and according to introduction hand book on HIV/AIDS, HIV is the human immunodeficiency virus that curses AIDS. HIV infects human cells and uses the energy and nutrients in that cells to grow and reproduced.
AIDS also according to information hand book on HIV/AIDS is Acquired immunodeficiency Syndrome. AIDS is a disease in which the body immune deficiency system breaks down and unable to fight off the other infectious disease and cancer.
When a body is affected with HIV, the viruses simply enter into the body cell and multiply, primarily in the white blood cell and later kill these white blood cells and other cell and weakening the Immune system and leave the person vulnerable to various infections and illnesses.
According to world record, over four hundred millions of people are living with HIV/AIDS worldwide and most of them are living in sub Saharan Africa. The major problems of HIV/AID are that most people living with HIV did not know that they carry HIV/AIDS and transfer viruses to others. HIV/AIDS is now considered as the world deadliest infectious disease.

In Nigeria 3.6percent of the population are living with HIV/AIDS (SEPKOWITX, K.A 2001).

The HIV/AIDS was first identify in 1985 and when reported at an internal AIDS conference in 1986 (Killings 2008). According to ABCDEFGH on AIDS (2007), it was only in 1991 that the federal ministry of health in Nigeria makes their first attempt to access Nigeria AIDS situation. The results showed that around 1.8% percent of populations were affected by HIV/AIDS.

Subsequently surveillance report revealed that in 1990 HIV prevalence was from 3.8 % in 1993 to 4.5% in 1998 according to http//data.uniaids.org access 2009. According to Worobey, et al (2008), a frame work developed and covered the period of 2005 – 2010 to reduce the spread of HIV/AIDS in Nigeria.

Process of HIV Transmitted in Nigeria

The mode of transmission of HIV in Nigeria Can is divided into three and namely:

Heterosexual sex: about 80% to 95% of HIV infection in Nigeria and resulted of Heterosexual sex with the report from GUSS, (1994)

Blood transfusions: Blood transfusion through unsafe blood account is the major cause of HIV in Nigeria, according Kwara, et al (2010).

Mother to child transmission: Decker et al (2000) estimated that twenty- two towards children are living with HIV in Nigeria.

HIV Prevention in Nigeria

The following are the common methods used to prevent HIV spread in Nigeria:
Hiv test: In Nigeria, HIV test are carry out through counseling services, Guerrant et al (1990)
Education: Guerrant, et al (2005), sex education is one of the major method of preventing HIV in Nigeria.
Use of condoms; HO-YEN ET AL (2008) estimated that 5.9% man per year used condoms in Nigeria
Media campaigns: Silvero et al (2009) discussed the important of media campaigns to reduce HIV spread in Nigeria.

2.0 Materials and Method

In this paper, the materials used are based on the simulation of 3.8% of the total population which is equivalent to 5,472000 which is number of people affected with HIV/AIDS in 2009.

Mathematical Model

The mathematical model was based on the following assumption

1. The numbers of people affected with HIV/AIDS remain corstant at the start.
2. Two conditions were imposed in the model that will be developed.
3. The values generated are used to represent numbers of people affected with HIV/AIDS.
4. The effect of time in treatment of HIV/AIDS is tested
5. 3.8 percent of the people in Nigeria are assumed living with HIV/AIDS

Modeling Development

This model shall be develop solely by differential equation given as

$$\frac{dp}{dt} = -KN(t) \qquad (1)$$

Where K = constant

N(t) =intial number of people living with HIV/AIDS.

From Eq.(1) above can be rewrite as

$$\frac{dp}{N(t)} = -kdt$$

eq2

Integrate with both sides to get

$$\ln N(t) = -kt + c$$

eq3

Where c =constant of integration

From eq 3, take log of both sides to get

N (t) = e^{-kt}. e^{c}
eq4

But let e^{c} = A

There four we have

N (t) = Ae^{-kt}
eq5

At time E=0 , N=(0)= 5,47000=A $e^{-k(0)}$

Time A=5472000

The model equation can be written as

N (t) = 5472000 e^{-kt}
eq6

By determine next value of N (t) the value of k can be determine.

Discussion of Results

MATLAB Version 2007 was used for simulation and the results were displayed in tabular and graphical form as shown below. Table 1-4 and Graph 1-4 clearly shown the trend at which HIV/AIDS can be prevented both the HIV can easily control by attend to it with the time of it noticed.

Table 1 and graph1 were compared with table 2 and graph 2 and the result shown that it is better to reduced or control HIV as soon as it is noticed. Likewise table 1to 4 graph 1 to 4

Table 1: Show how 5472000 pople were affected with hiv was reducing to 5000000 in 2 years can be represented in the reduction trends in the next 20 year

enter initial population:5472000

enter the population of people affected by hiv/aids pz:5000000

enter the time t for people affected:2

enter the time for prediction:20

population	year
5230679	1
5000000	2
4779494	3
4568713	4
4367228	5
4174629	6
3990523	7
3814536	8
3646311	9
3485505	10
3331790	11
3184854	12
3044399	13
2910137	14
2781797	15
2659117	16
2541847	17
2429749	18
2322594	19
2220165	20

5472000

GRAPH1: SHOW HOW 5472000 POPLE WERE AFFECTED WITH HIV WERE REDUCE TO 5000000 IN 2 YEARS CAN BE REPRESENTED IN THE REDUCTION TRENDS IN THE NEXT 20 YEAR

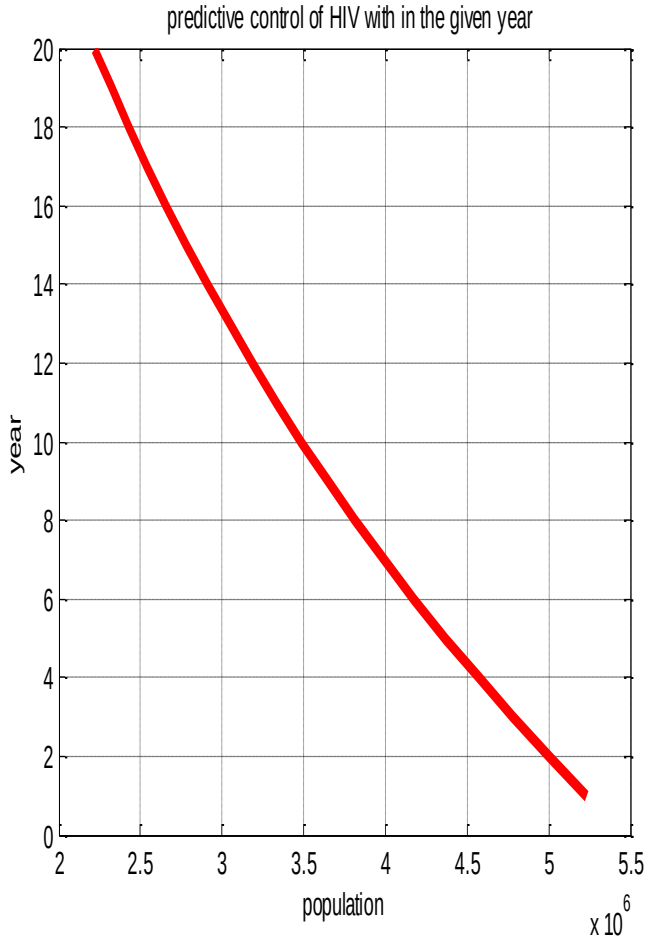


Table 2: Show how 5472000 pople were affected with hiv were reduce to 5000000 in 3 years can be represented in the reduction trends in the next 20 year

enter initial population:5472000

enter the population of people affected by hiv/aids pz:5000000

5472000

enter the time t for people affected:3

enter the time for prediction:20

population	year
5309913	1
5152627	2
5000000	3
4851894	4
4708175	5
4568713	6
4433383	7
4302061	8
4174629	9
4050971	10
3930976	11
3814536	12
3701545	13
3591901	14
3485505	15
3382260	16
3282073	17
3184854	18
3090515	19
2998970	20

Graph 2: Show how 5472000 pople were affected with hiv were reduce to 5000000 in 3 years can be represented in the reduction trends in the next 20 year

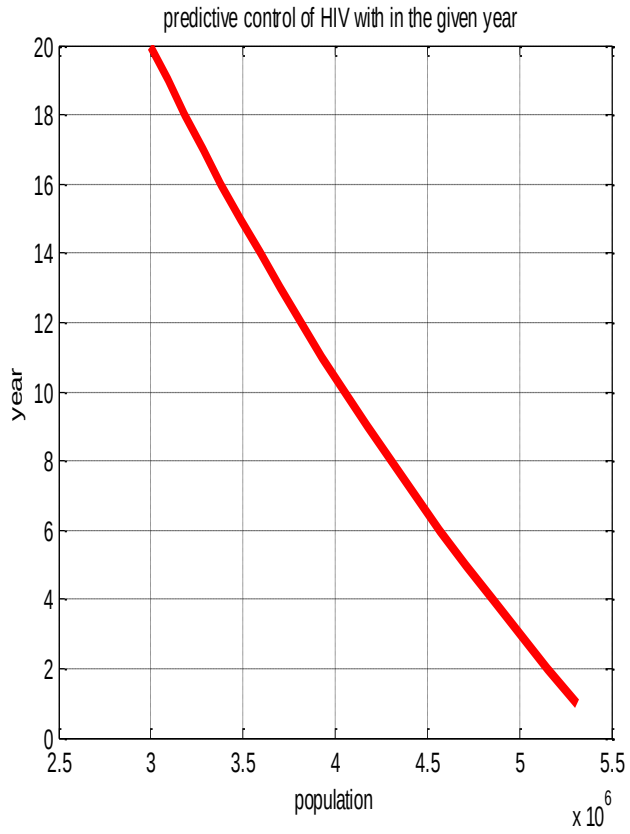


Table 3: Show how 5472000 pople were affected with hiv were reduce to 4000000 in 2years can be represented in the reduction trends in the next 20 year

enter initial population:5472000

enter the population of people affected by hiv/aids pz:4000000

enter the time t for people affected:2

enter the time for prediction:20

population	year
4678461	1
4000000	2
3419928	3
2923977	4
2499947	5
2137410	6
1827447	7
1562434	8
1335853	9
1142130	10
976501	11
834890	12
713816	13
610300	14
521796	15
446126	16
381429	17
326115	18
278823	19
238388	20

ans =

5472000

Graph 3: Show how 5472000 pople were affected with hiv were reduce to 4000000 in 2years can be represented in the reduction trends in the next 20 year

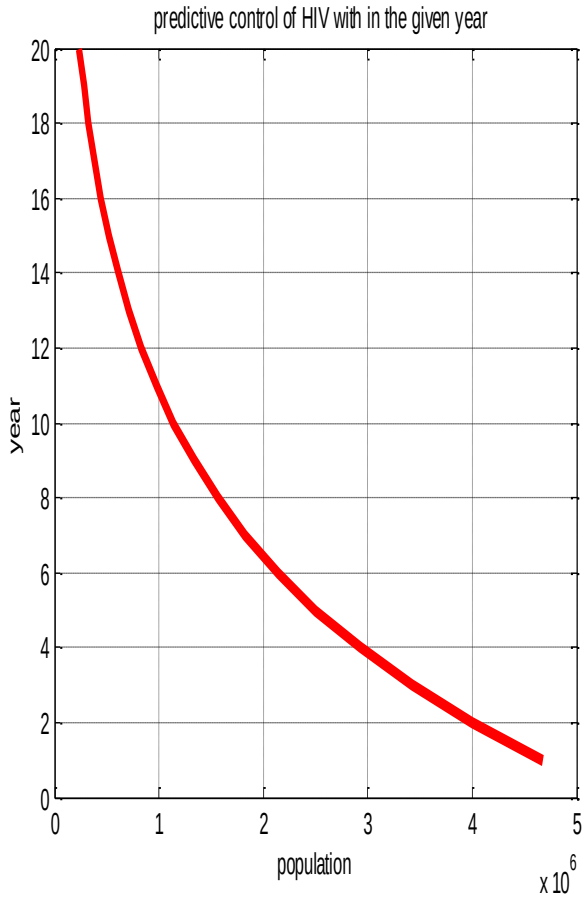


Table 4: Show how 5472000 pople were affected with hiv were reduce to 4000000 in 3years can be represented in the reduction trends in the next 20 year

enter initial population:5472000

enter the population of people affected by hiv/aids pz:4000000

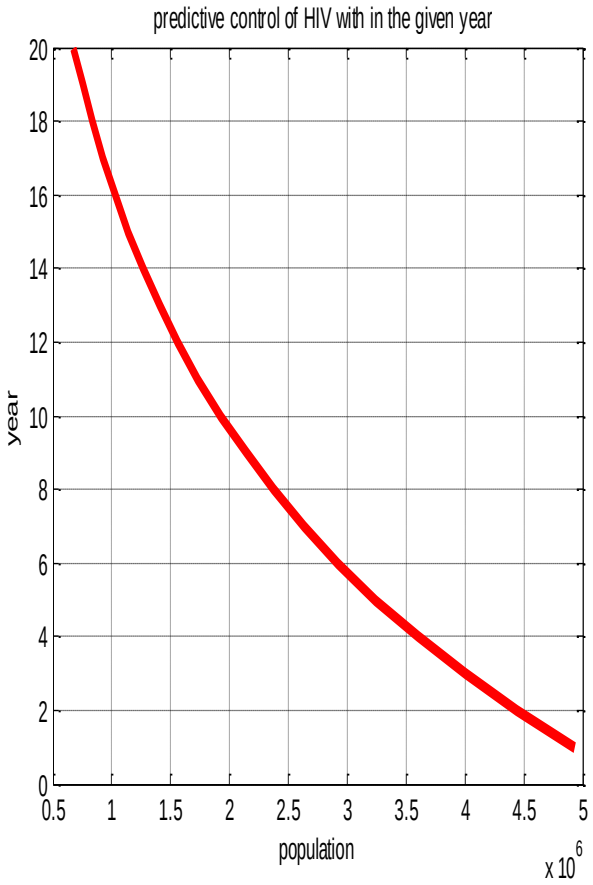
enter the time t for people affected:3

enter the time for prediction:20

population	year
4929286	1
4440399	2
4000000	3
3603280	4
3245906	5
2923977	6
2633976	7
2372738	8
2137410	9
1925421	10
1734458	11
1562434	12
1407472	13
1267878	14
1142130	15
1028854	16
926812	17
834890	18
752086	19
677494	20

ans = 5472000

Graph 4: Show how 5472000 pople were affected with hiv were reduce to 4000000 in 3 years can be represented in the reduction trends in the next 20 year



1.0 Conclusion And Recommendations

Material mathematical and visualization model that were develop led to the following conclusions:

1. It is better to prevent HIV spread immediately it noticed
2. The mathematical model that was developed can be used as guide in control HIV.

It is thereby recommended that:

1. The model can be used as a test case in control of HIV
2. It the model can be use to know the numbers of people to be take care in a particular year
3. This model can be use as demonstrations in schools In order to explain how HIV/AIDS can be monitored and controlled.

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